

## **Indicator: Human Exposure Under Control on Contaminated Lands (219)**

Contaminated lands include sites contaminated as a result of improper disposal of toxic and hazardous wastes in the past, as well as improper handling or accidents occurring at active hazardous waste management facilities. People and ecosystems can be harmed if they come into contact with these toxic and hazardous materials, either on-site or as a result of migration offsite through air, water, and groundwater. Trends in addressing the area covered by contaminated lands are all difficult to document on a nationwide basis, because efforts have focused on characterization of contamination and remedial responses at specific sites and their local surroundings, and because federal and state governments use a variety of laws and regulations to initiate, implement, and enforce cleanup. Restoration at the nation's most contaminated lands, however, is managed primarily by EPA's Superfund Program or its RCRA Corrective Action Program.

The Superfund Program investigates and collects data on potentially contaminated sites to determine whether they are contaminated and require cleanup. When a potentially hazardous waste site is reported to EPA, trained inspectors determine whether the site presents a hazard to human health and the environment. Sites that pose the greatest threat are placed on the National Priority List (NPL). Sites are considered for deletion from the NPL when all cleanup goals are met and there is no further need for federal action. Approximately 40 million people, 13% of the US population, live within 2.5 miles of an NPL site. A site that has been proposed to the NPL is termed "final" once it has been formally added to the NPL.

The RCRA Corrective Action Program addresses the clean-up of contamination at active hazardous waste management facilities arising from current or past solid and hazardous waste management activities. Approximately 6,000 hazardous waste management facilities fall within the domain of the RCRA Corrective Action Program. Approximately 3,800 of these facilities have corrective action already underway or will need to implement corrective action as part of the process to obtain a permit to treat, store, or dispose of hazardous waste. A cleanup baseline of 1,714 of these were designated high-priority sites targeted for immediate action by federal, state, and local agencies and are used as the baseline against which the cumulative number of corrective action sites with human exposure under control are measured.

One of the priorities for these sites is controlling current human exposures to site contamination. EPA and state officials determine if current human exposures are under control, if current exposure levels to hazardous substances at potential points of contact are below appropriate risk-based screening levels, or if actions were taken to reduce or eliminate all current exposures - such as removing contaminated media, providing alternative water supplies, and restricting access and other land use controls. This determination is based on site-specific characterization information and monitoring data (usually hundreds of analytical samples) pertaining to relevant environmental media (e.g., soil, indoor air, outdoor air, groundwater and surface), current human activity patterns, and actions taken to prevent exposure. All potential exposure routes are assessed, including inhalation, direct contact, or ingestion of the contaminated media or food impacted by contaminated media. Sites that are not designated as under control are designated either "not under control" or as having "insufficient data" (EPA 2004).

### **What the Data Show**

Control of human exposure to site contamination increased from 38% of the 1,714 high-priority RCRA Corrective Actions sites in 2000 to 84% of the sites in 2004, increasing 11.5% each year on average (Figure 219-1).

Control of human exposure to site contamination increased from 79% of the 1,498 final and deleted NPL sites in 2002 (the first year this indicator was calculated for NPL sites) to 82% of the 1,529 final and deleted NPL sites in 2004 (Figure 219-2).

### **Indicator Limitations**

- The NPL does not represent all of the contaminated or potentially contaminated sites listed in the CERCLIS database, the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database that contains information on hazardous waste sites, potential hazardous waste sites, and remedial activities across the nation.
- The indicator covers the 1,714 high-priority RCRA corrective action sites, and not the entire group of 6000 hazardous waste management sites that fall under the RCRA Corrective Action Program.
- The indicator does not typically make measurements of exposure biomarkers among potentially exposed individuals at the Superfund NPL or RCRA Corrective Action Sites.
- Concentrations of toxic and hazardous waste that must not be exceeded to designate a site as under control vary from state to state.
- The indicator is based on the certification by a responsible official that the criteria necessary to designate a site as under control have been met. To the extent that the certification lags the actual year in which human exposure actually came under control or was the result of having insufficient information in previous years, the actual trend in the percentage of sites in which human exposure is under control may be underestimated.
- Regarding NPL sites, 3 years (2002-2004) may not be enough time to assess a trend of human exposure under control.

### **Data Sources**

National Priority List/Superfund Sites: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. CERCLIS.

<http://www.epa.gov/enviro/html/cerclis/>

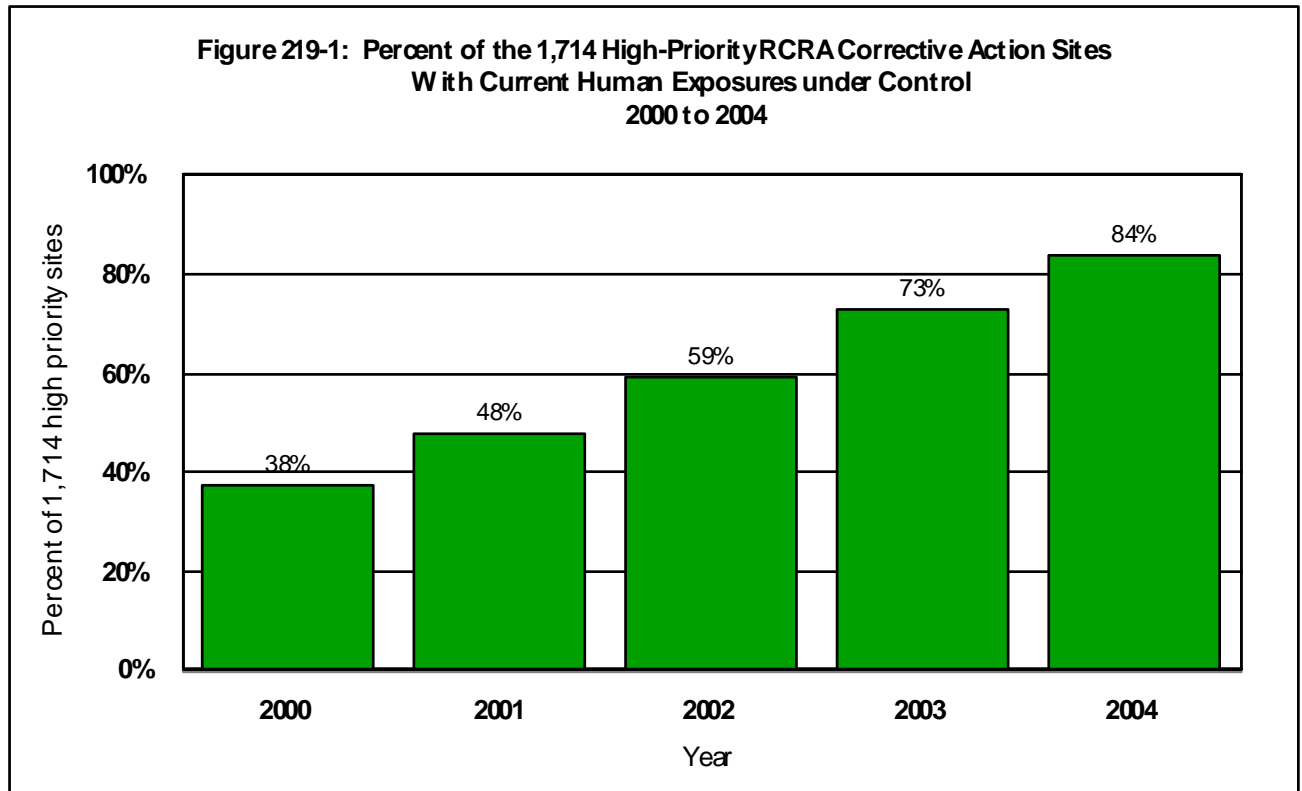
RCRA Corrective Action Sites: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. RCRA Corrective Action. <http://www.epa.gov/epaoswer/hazwaste/ca>

<http://www.epa.gov/epaoswer/hazwaste/data/index.htm#rcra-info>

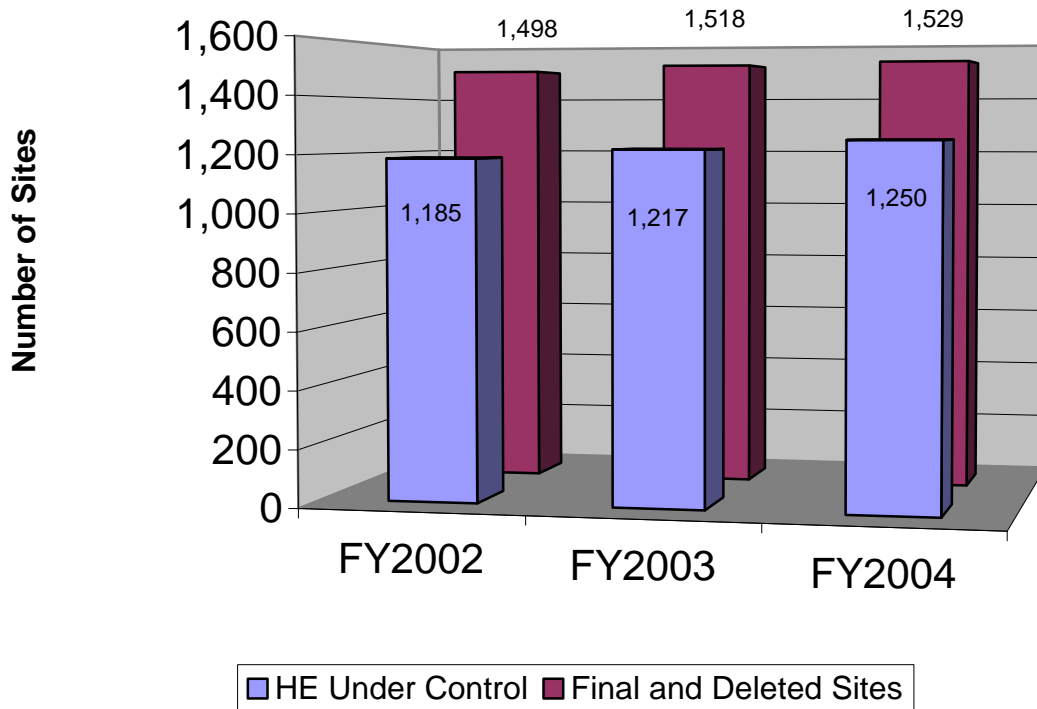
### **References**

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. RCRA Corrective Action, Environmental Indicators (2004). <http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm>

## Graphics



**Figure 219-2: Comparison of HE Under Controlled Sites to Final and Deleted Sites**



## R.O.E. Indicator QA/QC

**Data Set Name:** HUMAN EXPOSURE UNDER CONTROL ON CONTAMINATED LANDS

**Indicator Number:** 219 (116286)

**Data Set Source:** CERCLIS; RCRA Info

**Data Collection Date:** Ongoing: 2001 - Present

**Data Collection Frequency:** 1 year or as changes in site conditions warrant

**Data Set Description:** Indicates whether contamination is below protective, risk-based levels at NPL and high priority RCRA Corrective Action sites or if not, whether adequate controls are in place to prevent unacceptable human exposures under current land and ground water use conditions.

**Primary ROE Question:** What are the trends in contaminated land and their effects on human health and the environment?

### Question/Response

**T1Q1** Are the physical, chemical, or biological measurements upon which this indicator is based widely accepted as scientifically and technically valid?

Yes. The indicator relies on three types of information: 1) contaminant concentrations in media (e.g., air, water, land, sediment, biota); 2) site-specific observations regarding human contact at exposure points; and 3) findings from human health risk assessment. Contaminant data are collected using standard analytical methods that result in data of known quality. Observations regarding human contact at exposure point concentrations are a fundamental component of exposure assessment (current scenarios). Human exposure and human health risk assessment practices are well defined and widely accepted as a valid basis for exposure and risk characterization at Superfund and high priority RCRA Corrective Action sites.

<http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm>

<http://www.epa.gov/superfund/accomp/ei/ei.htm>

**T1Q2** Is the sampling design and/or monitoring plan used to collect the data over time and space based on sound scientific principles?

Yes. Regional and state (for RCRA Corrective Action) personnel respond to a survey based on data collected and conclusions derived (e.g., through exposure assessment) from sampling designs, monitoring plans, and other field observations that were established as the basis for risk management decisions at Superfund and high priority RCRA Corrective Action sites and are based on sound scientific principles. <http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm>

<http://www.epa.gov/superfund/accomp/ei/ei.htm>

**T1Q3** Is the conceptual model used to transform these measurements into an indicator widely accepted as a scientifically sound representation of the phenomenon it indicates?

Yes. The conceptual model mirrors the standard human risk assessment model. The indicator asks whether there are complete exposure pathways between contaminated media and current human receptors (exposure assessment) and, if so, whether the complete exposure pathways represent unacceptable risk (risk characterization). <http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm>

<http://www.epa.gov/superfund/accomp/ei/ei.htm>

**T2Q1** To what extent is the indicator sampling design and monitoring plan appropriate for answering the relevant question in the ROE?

The indicator documents the outcomes of a variety of EPA actions, including enforcement, site assessment, and physical cleanup to address human health stressors (i.e., exposure to contaminants via complete exposure pathways) associated with Superfund and high priority RCRA Corrective Action sites. The indicator addresses all media and measures impacts on stressors to human health directly (not via impacts on stressors to ambient conditions).

**T2Q2** To what extent does the sampling design represent sensitive populations or ecosystems?

The indicator measures whether there are unacceptable human exposures via complete exposure pathways, and relying on standard risk assessment techniques. Risk assessment takes into account sensitive populations in the exposure assessment (RME individual) and toxicity assessment (factors for intraspecies variability). Advances in risk assessment practice to better address sensitive populations will be automatically incorporated into the indicator as they are incorporated into practice. The indicator does not address ecosystems.

**T2Q3** Are there established reference points, thresholds or ranges of values for this indicator that unambiguously reflect the state of the environment?

Yes. The indicator measures whether there are complete pathways between contaminated media and human receptors that represent unacceptable risk to human health. "Contamination" is defined based on documented risk-based levels. "Unacceptable risk" is defined based on the cancer risk range ( $10^{-6}$  to  $10^{-4}$  excess lifetime cancer risk) and a hazard index of 1

**T3Q1** What documentation clearly and completely describes the underlying sampling and analytical procedures used?

The FY-04/05 Superfund/Oil Implementation Manual (SPIM) outlines indicator definitions and reporting requirements. <http://www.epa.gov/superfund/action/process/spim04.htm> (See Appendix B, Part IV). The Superfund Environmental Indicators Guidance Manual includes a discussion of indicator background, reporting requirements, detailed instructions for making the Human Exposure Under Control determination, frequently asked questions, and CERCLIS data entry instructions. The RCRA Corrective Action website provides detailed instructions for making the Human Exposure Under Control determination, frequently asked questions, and training slides. See <http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm> Further guidance is provided in the Data Quality Objectives Process for Hazardous Waste Site Investigations (EPA/600/R-00/007), see <http://www.epa.gov/QUALITY/qs-docs/g4hw-final.pdf>; Guidance for the Data Quality Objective Process (EPA/600/R-96/055), see <http://www.epa.gov/QUALITY/qs-docs/g4-final.pdf>; and SW-846: Test Methods for Evaluating Solid Waste Physical/Chemical Methods, see <http://www.epa.gov/epaoswer/hazwaste/test/main.htm#Table>

**T3Q2** Is the complete data set accessible, including metadata, data-dictionaries and embedded definitions or are there confidentiality issues that may limit accessibility to the complete data set?

Human Exposure Under Control determination can be viewed via the CERCLIS Public Access database. <http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm> Further information on the Human Exposure Under Control indicator including definition and quarterly data can be viewed via the Superfund Environmental Indicators Website. <http://www.epa.gov/superfund/accomp/ei/exposure.htm> Information on the Human Exposure Under Control indicator determinations for high priority RCRA Corrective Action sites can be found at <http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm>, with links to each EPA Region's Corrective Action website where details about each facility accessed can be observed.

**T3Q3** Are the descriptions of the study or survey design clear, complete and sufficient to enable the study or survey to be reproduced?

The Human Exposure Under Control survey is available in Portable Document Format (PDF) on the Superfund Environmental Indicators Website.

<http://www.epa.gov/superfund/accomp/ei/hesurvey.pdf> Information on the Human Exposure Under Control indicator determinations for high priority RCRA Corrective Action sites can be found at <http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm>, with links to each EPA Region's Corrective Action website where details about each facility accessed can be observed.

**T3Q4** To what extent are the procedures for quality assurance and quality control of the data documented and accessible?

Human Exposure Under Control data quality objectives are thoroughly outlined in the Human Exposure/Migration of Contaminated Ground Water Under Control CERCLIS Data Quality Objectives (DQO) document. The DQO includes a discussion of data completeness, accuracy, timeliness, and consistency. The DQO is available to EPA Headquarters and the Regions via EPA's CERCLIS3 Document Database. The RCRA Corrective Action website provides detailed instructions for making the Human Exposure Under Control determination, frequently asked questions, and training slides. See <http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm> Further guidance is provided in the Data Quality Objectives Process for Hazardous Waste Site Investigations (EPA/600/R-00/007), see <http://www.epa.gov/QUALITY/qs-docs/g4hw-final.pdf>; Guidance for the Data Quality Objective Process (EPA/600/R-96/055), see <http://www.epa.gov/QUALITY/qs-docs/g4-final.pdf>; and SW-846: Test Methods for Evaluating Solid Waste Physical/Chemical Methods, see <http://www.epa.gov/epaoswer/hazwaste/test/main.htm#Table>

**T4Q1** Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)?

The unit of measure for the indicator is the site. This is a population measure not requiring inferential statistics. Due to lack of adequate data, the indicator does not measure the extent to which human exposure to contaminants associated with non-NPL or lower-priority RCRA Corrective Action sites has been mitigated, and does not attempt to generalize beyond exposures relative to NPL and high priority RCRA Corrective Action sites. Currently, EPA believes that there are over 6,500 facilities subject to RCRA corrective action statutory authorities. Of these, approximately 3,800 facilities have corrective action already underway or will need to implement corrective action as part of the process to obtain a permit to treat, store, or dispose of hazardous waste. EPA refers to these 3,800 facilities as the "corrective action workload." To help prioritize resources further, EPA established specific short-term goals for 1,714 high priority facilities referred to as the RCRA Cleanup Baseline. The RCRA Corrective Action program ranked sites low, medium, or high priority, based on a site's environmental releases and potential for impacting people and the environment. If a facility ranked high before 1997, it was automatically included on the baseline. The states and EPA also added some sites to the RCRA Cleanup Baseline, which posed a potentially significant environmental risk or were of particular concern to communities, despite being ranked medium or low. The facilities on the RCRA Cleanup Baseline comprise the basis of the Corrective Action Program's 2005 goals under the Government Performance and Results Act (GPRA).

**T4Q2** Are uncertainty measurements or estimates available for the indicator and/or the underlying data set?

Uncertainties in the exposure and risk assessment findings used to support this indicator are evaluated on a site-specific basis but are not rolled-up for a measure of cross-indicator uncertainty. No formal study has been conducted regarding the reproducibility of survey responses.

**T4Q3** Do the uncertainty and variability impact the conclusions that can be inferred from the data and the utility of the indicator?

The uncertainty and variability could impact the conclusions that can be inferred from the data. However, unless there are systematic biases introduced to the process (e.g., systematic differences in interpretation of questions), the impacts of these factors on the aggregated data and overall conclusions should be minimal. The Superfund and RCRA Corrective Action programs have implemented guidance and training to minimize the effects of variability and systematic bias.

**T4Q4** Are there limitations, or gaps in the data that may mislead a user about fundamental trends in the indicator over space or time period for which data are available?

In some instances, there may be underlying factors (e.g., the reassessment of the toxicity of a prevalent contaminant of concern at Superfund and high priority RCRA Corrective Action sites) that could cause a data shift, the cause of which would not be evident to the user. The indicator instrument documents reasons for changes in the indicator determination that could be monitored to identify and communicate to the user the effect of exogenous factors on indicator trends. Superfund NPL and RCRA Corrective Action sites are a subset of contaminated lands in the U.S.